REMARKS

Claims 2, 15, 16, 25-27, 34-45, 47-59, 61, 62, 64-73, and 75-78 are currently pending. Applicants have canceled claim 63. Claims 34, 61, and 78 have been amended.

Applicants have amended claim 61 to recite "said pond" in place of "said outer pond." The amended phrase finds support in claim 50, from which claim 61 depends. Incidentally, Applicants have noticed a similar typographical error in claim 34. The phrase "said outer pond" in claim 34 has now been amended to recite "said pond." This amendment is supported throughout Applicants' specification, *e.g.*, in previous claim 34 and those claims depending therefrom.

Further, solely for the sake of clarity, Applicants have amended claim 78 to depend from claim 77. The amendment finds support throughout Applicants' specification, *e.g.*, in previously presented claims 77 and 78.

No new matter has been added.

Rejections under 35 U.S.C. §112, Second Paragraph, are Rendered Moot

The Examiner rejected claims 61 and 63 as allegedly indefinite due to asserted redundancy. Further, the Examiner rejected claim 61 as allegedly indefinite, asserting that the phrase "said outer pond" lacked antecedent basis.

Claim 61 has been amended to recite "said pond" in place of "said outer pond" (the amended phrase having proper antecedent basis is claim 50), and claim 63 has been canceled. Accordingly, any alleged bases for rejection of Applicants' claims under §112, second paragraph, have been rendered moot.

Obviousness Rejections are Traversed - Oswald, in view of Sheaffer and Locklair

The Examiner rejected all pending claims under 35 U.S.C. § 103(a) as allegedly obvious over the Oswald article in view of Sheaffer and Locklair. Applicants respectfully traverse the rejection based on the following remarks.

Applicants have filed a Supplemental Information Disclosure Statement herewith solely to correct the citation of the Oswald article (web-available article, as currently cited) to more

properly reference the original journal publication: Oswald, W.J. *et al.*, "Performance of Methane Fermentation Pits in Advanced Integrated Wastewater Pond Systems," *Wat. Sci. Tech.*, *30(12)*:287-295 (1994). Applicants note that the content of the original publication (copy enclosed) is substantively identical to the currently cited web-available version, but does not contain typographical errors apparently resulting from a secondary translation back into the English language from an intermediate Spanish version.

Oswald

The Examiner acknowledged that Oswald fails to disclose "the 6 m depth limitation." However, the Examiner asserted that Sheaffer and Locklair cure this acknowledged deficiency of the primary reference.

Further to the Examiner's acknowledgement of the failure of Oswald to disclose "a 6 meter depth limitation," Applicants wish to provide the following comments regarding the importance of this feature of the claimed invention. The depth of the inner ponds or fermentation pits relates to the maintenance of a substantial anaerobic condition in the treatment zone. The depth of such pits facilitates the maintenance of a "stable microbiological methane fermentation zone," *e.g.*, by decreasing the chance that mixing will occur due to surface wind disturbances. Throughout the specification, Applicants teach the maintenance of a stable, substantially anaerobic condition in the fermentation ponds/pits/zones. For example, the following passages teach the importance of this feature, and its relationship to pond depth:

> The key to successful methane fermentation is the establishment of protected anoxic zones where naturally present heterotrophic and methane bacteria flourish, within primary waste ponds, sometimes referred to as Advanced Facultative Ponds (AFP). *The zones are created by preventing the intrusion of cold water containing dissolved oxygen*. This protection can be achieved economically by isolating the fermentation zone with a surrounding wall or other vertical structure to prevent the intrusion of cold, oxygen-bearing water. *Crucial factors for the special zones of stable methane fermentation are: depth*, surface area, volume, ...

Specification, at page 7, lines 10-18.

> The inner pond is designed to prevent intrusion of dissolved oxygen from the outer pond and contain semi solid slurry in the highly reduced anaerobic state

> needed as substrate to foster methane fermentation. The inner pond is also designed to foster sedimentation of solids as well as their conversion to methane.
>
> Because dissolved oxygen is inhibitory to methane fermentation, the fermentation zones, in one embodiment of the invention, are designed to be 1 to 10 meters deep, preferably 2 to 8 meters deep, and most preferably 3 to 5 meters deep with high walls *to prevent intrusion of dissolved oxygen from the outer pond by convection or by wind driven currents.*

Specification, at page 3, lines 22-30.

> Also, *since the column of water above the pit bottom is 6-8 meters (18-25 feet), a pressure of 500-600 grams/cm^2 (slightly over 7 psi) compresses loose solids tending to increase their density and hence their rate of sedimentation.*

Specification, at page 6, lines 24-27.

The foregoing passages teach at least two advantageous functional features of the invention that are directly related to pond depth: 1) the substantial exclusion of dissolved oxygen, *e.g.*, by lowering the possibility of wind-induced mixing using greater depths such as the presently claimed minimum of 6 meters; and 2) the compression of loose solids to increase their rate of sedimentation. The advantages of the presently claimed invention are obtained, at least in part, by providing a fermentation pond, pit, or zone as described, having a bottom that is "at least 6 meters" below the surface.

The Oswald reference provides a discussion that includes the concept of an inner pond or fermentation pit. At page 290 of the original publication, submitted herewith, the fermentation pits ("two in-pond digestors") are disclosed as "having an average depth of about 2.1 meters." As correctly noted by the Examiner, no minimum depth is disclosed. Further, Applicants respectfully point out below that: 1) the cited secondary references (Sheaffer and Locklair) fail to teach a depth that is "at least 6 meters" as recited in Applicants' claims; and 2) none of the cited references provide any suggestion or motivation to combine any teaching regarding depth of ponds, basins, etc., with any teaching of Oswald, for at least the reason that the secondary references teach away from Applicants' invention.

Sheaffer

The Examiner cited a passage from Sheaffer reciting that "treatment cell 24 may be formed as a substantially frustoconical space which is about 14.5 feet deep from the pond surface as it exists . . . ." Further on in the cited passage, Sheaffer recites that "the difference between the depth of cell 24 and the more general depth 26 of storage volume 28 should be at least nine to twelve feet, and preferably is about 11 ½ feet, although it could be much greater." Accordingly, the express recitation of the depth of the cell relative to the pond surface is "about 14.5," and the maximum difference expressly recited in Schaeffer is "twelve feet" with "about 11 ½ feet" recited as preferable. Accordingly, the asserted relevance of this passage apparently depends solely on the statement by Sheaffer that the depth "could be much greater," as all other depths specifically recited are no more than slightly over half of the minimum depth of 6 meters currently recited in Applicants' claims.

Initially, Applicants respectfully point out that the statement in Sheaffer that the depth "could be much greater" fails to teach or suggest any minimum depth of "at least 6 meters" as recited in Applicants' claims. The statement is permissive, in that the depth "could be" greater. The statement implies that all allegedly benefits of the Sheaffer disclosure are achieved at the expressly recited depth. Accordingly, assuming solely for the sake of argument that some greater depth above 6 meters is implied by the cited passage, no motivation whatsoever is provided to obtain a cell of greater depth.

Further, any alleged teaching of Sheaffer must be considered in view of the teaching of the reference as a whole. In this regard, it must be noted that Sheaffer teaches away from the "stable microbiological methane fermentation zone" as claimed by Applicants. Throughout, Sheaffer teaches aeration of the "treatment cell." At col. 2, lines 29-38, Sheaffer states:

> An end of an air conduit is sited in the treatment cell to be spaced from the bottom and to be spaced substantially below the top of the treatment cell. The air conduit introduces air into the treatment cell at a rate which is at least 1500 and more preferably is 2500 cubic feet STP for each pound of biomass (measured as BOD_5) introduced into the treatment cell by the wastewater. An aerator preferably is placed over the air conduit end to better distribute the injected air.

Further, at col. 4, lines 37-55, Sheaffer makes clear the location and extent of this aeration:

> Having given an overview of the system according to the invention, further details of it will be described. Continuing to refer to FIGS. 1 and 2, an aeration blower 44 is provided to blow the air through an aeration pipe 46 to an aerator 48. . . . *An end 49 of the aeration pipe 46 is placed from one to two feet above the bottom 51 of the treatment cell 24*, and at least eight to ten feet below elevation 26, which is the demarcation between cell 24 and storage volume 28. An aerator 48 is situated over pipe end 49 so as to distribute injected air into a helical pattern. Pipe end 49 and aerator 48 preferably are sited at a central location in cell 24. The aeration blower 44 is sized and operated to provide a volume of air which is *at least 1500 cubic feet* as measured at standard temperature and pressure (STP), *and preferably at least 2500 cubic feet of air, to the treatment cell 24 for every pound of* BOD_5 in the wastewater to be converted.

Emphasis added. Further still, at col. 5, lines 58-65, Sheaffer characterizes the aeration as follows:

> When air is injected through pipe 46 to a location beneath or in the bottom of aerator 48, it will rise, being broken up into a pattern of bubbles by aerator 48. As the bubbles 63 rise, they will gradually be absorbed into the water around them, and will be smaller or even nonexistent by the time they reach the top of pond 20.
>
> *The bubbles 63 also act to entrain streams 67 of wastewater upward*, disinfecting it as it goes.

Emphasis added.

Accordingly, irrespective of any other assertions of anaerobic features by Sheaffer, the "treatment cell" of Sheaffer would be recognized by one of ordinary skill in the art as essentially *aerobic* due to the disclosed aeration. Further, Sheaffer specifically teaches that the small zone below the aerator will be disturbed by the aeration because the "bubbles 63 also act to entrain streams 67 of wastewater upward . . . ." Any assertions of an "anaerobic zone" beneath the aerator appear to be inconsistent with this teaching, as would be readily recognized. One of ordinary skill in the art would readily recognize that the disclosure of Sheaffer teaches away from the "stable microbiological methane fermentation zone" as claimed by Applicants.

Locklair

Similarly, Locklair fails to cure the acknowledged deficiency of Oswald because it provides no teaching of a methane fermentation zone ("primary waste pond") having a depth of

"at least 6 meters." The passage of Locklair cited by the Examiner is reproduced below (col. 4, lines 48-58):

> The air burst injection nozzle 60 and process of intermittent release of compressed air is compatible with numerous types of existing diffuser systems. For instance, *an aerated treatment basin* such as a typical activated sludge treatment basin, waste lagoon, or holding tank *may be lined with air diffusers along its length.* A typical basin has an average depth of 12-15 feet, though some basins are as much as 25 feet deep. *Placement of the air burst mixing injectors at selected points within the basin can be used to achieve greater dissolved oxygen levels. The turbulent displacement also brings about increased mixing of the liquids.*

This cited passage expressly states that the entire "basin" discussed is "aerated." One of skill in the art, reading this passage and making proper reference to the drawings (and, in fact, the disclosure of Locklair as a whole), would readily recognize that Locklair teaches away from a substantially anaerobic "stable microbiological methane fermentation zone" as claimed by Applicants.

Although one of ordinary skill in the art would recognized the requirement for a substantially anaerobic condition in Applicants' claimed "stable microbiological methane fermentation zone," Applicants point out that this aspect is expressly taught throughout their specification, *e.g.*, at page 3, lines 22-24: "The inner pond is designed to prevent intrusion of dissolved oxygen from the outer pond and contain semi solid slurry in the highly reduced anaerobic state needed as substrate for methane fermentation." Accordingly, the incidental mention of a depth of "as much as 25 feet" in connection with "an aerated treatment basin" cannot cure any deficiency of Oswald with respect to Applicants' claimed invention. As noted, no person of ordinary skill in the art would find any suggestion of motivation to combine any teaching of Locklair with that of Oswald for at least the reason that Locklair teaches an aerated system.

Failure of the Cited References to Support a Prima Facie Case of Obviousness

MPEP §706.02(j) states:

> To establish a prima facie case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must

> be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art and not based on applicant's disclosure.

The Examiner has acknowledged that Oswald fails to teach a depth of a primary waste pond or fermentation pit of "at least 6 meters." Sheaffer and Locklair teach away from anaerobic methane fermentation and *any teaching of depth for any pond or basin* in these references occurs in the context of the disclosure of aerated environments and/or systems. Accordingly, even if Sheaffer and Locklair were considered to teach greater depths for some pond, basin, or cell, such teaching could not properly be combined with any teaching of Oswald to support an alleged *prima facie* case of obviousness against Applicants' claimed invention. The "teaching away" by the secondary references is inconsistent with any "suggestion or motivation" to combine their teachings with that of Oswald, as required by the appropriate standard for establishing a *prima facie* case.

Obviousness Rejections are Traversed - Sheaffer and Locklair, alone or in view of Cretini

The Examiner rejected claims 50-59, 61-73, and 75-78 under 35 U.S.C. §103(a) as allegedly obvious over Sheaffer and Locklair, alone or in view of Cretini. In view of the foregoing and following remarks, Applicants respectfully traverse the rejection.

Sheaffer

Many of the relevant deficiencies of Sheaffer are noted and discussed above. Applicants acknowledge that Sheaffer mentions an "anaerobic zone 57" which allegedly "acts as a mesophilic digester . . . [and that] organic matter in the wastewater breaks down into methane . . . ." Sheaffer, at col. 6, lines 21 and 22. However, the aeration discussed throughout Sheaffer, as noted above, is inconsistent with the establishment of this alleged anaerobic zone.

At col. 2, lines 29- 32, Sheaffer states that the "end of an air conduit is . . . to be spaced substantially below the top of the treatment cell." Further, an aerator over the air conduit end is recited as preferable "to better distribute the injected air." Sheaffer, col. 2, lines 37 and 38. At col. 4, lines 41-46, Sheaffer states that "[a]n end 49 of the aeration pipe 46 is placed from one to

two feet above the bottom 51 of the treatment cell 24, and at least eight to ten feet below elevation 26, which is the demarcation between cell 24 and storage volume 28." In addition, and as noted above, the resulting air bubbles "also act to entrain streams 67 of wastewater upward."

Disclosure of such a structure, operating as described, teaches away from the invention disclosed and claimed by Applicants. In particular, Sheaffer fails to teach or suggest "a fermentation pit . . . having a bottom that is at least 6 meters from the top surface" of a pond. Further, irrespective of pit depth, the aeration disclosed in Sheaffer is inconsistent with obtaining the benefits of Applicants' claimed invention. In fact, the recitation in Applicants' claims of a depth of "at least 6 meters" relates to the claimed "establishing of methane fermentation." Aeration in a location as disclosed by Sheaffer (that is, "one to two feet above the bottom") teaches away from Applicants' claimed invention, as would be readily recognized by one of ordinary skill in the art.

Locklair

The deficiencies of Locklair are substantially as noted above. Further, Locklair does not even purport to achieve any anaerobic process or methane fermentation. The Abstract of Locklair is reproduced below:

> A method and apparatus of increasing the oxygen transfer rate, residence time, and circulation pathways within waste water is provided. The process uses cyclic bursts of compressed air to establish flow patterns within waste water. The flow patterns increase the residence time of air supplied by conventional aeration sources. The increased aeration facilitates the treatment of the waste water. Additional benefits which result from the process include increased mixing of the waste water along with additional aeration brought about from the cyclic air bursts.

The entire abstract emphasizes the direct contrast with the disclosed mode of operation of Applicants' invention. Accordingly, one of skill in the art would readily recognize that Locklair teaches away from Applicants' claimed methods of establishing methane fermentation.

Cretini

Cretini fails to teach or suggest any fermentation pit of *any* depth. Further, as with Sheaffer and Locklair, one of ordinary skill in the art would recognize that the entire single

lagoon disclosed by Locklair would be sufficiently *aerobic* to exclude the possibility of any significant methane fermentation.

Any asserted teachings of Sheaffer and Locklair must be considered in the context of the disclosed *aerated* systems which teach away from Applicants' claimed invention. Accordingly, due at least to the teaching of aerated systems in Sheaffer and Locklair, one of ordinary skill in the art would find any suggestion or motivation to combine the teachings of these references with any other reference, including Cretini, in order to obtain Applicants' claimed invention. Therefore, neither Sheaffer nor Locklair are properly cited to supply any teaching or suggestion of depth for fermentation pits or zones as claimed by Applicants.

Because Cretini fails to teach any depth of a "fermentation pit" (Applicants' independent claims 50 and 77), or a "separate fermentation zone" (Applicants' claim 66), Cretini could not possibly cure the deficiencies of Sheaffer or Locklair. Accordingly, the cited references fail to support a *prima facie* case of obviousness against Applicants' claimed invention.

Conclusion

Because all alleged bases for rejection of Applicants' claims have been rendered moot or properly traversed, Applicants respectfully request that all rejections be reconsidered and withdrawn. Early notice of the allowability of Applicants' claims is respectfully requested.

Should the Examiner have any questions regarding this Amendment and Reply, the Examiner is invited to contact Applicants' undersigned representative at the number indicated below.

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